REMARKS

Review and reconsideration on the merits are requested.

Although the Examiner does withdraw one art rejection in Paragraph 4 of the Action, in Paragraph 6 of the Action the Examiner rejected claims 1-4 and 7-15, all claims under examination at the time of the Action, under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5,180,750 Sugaya et al (Sugaya) in combination with U.S. Patent 4,136,067 Reed et al (Reed).

The Examiner's position is set forth in the Action in detail, and will not be repeated here except as necessary to aid in an understanding of Applicants' traversal which is now presented. Applicants specifically note that the Examiner refers to the term "fine" in claim 1 as a relative term, and not a limitation because the term is indefinite. Applicants combine claims 1, 2 and 15, whereby claim 1 now is specific to, *inter alia*, fine particles having a diameter in the range of 1 μm to 100 μm. The limits to claim 1 are narrowing limits.

The Present Invention

In broad terms, the anion exchanger of the present invention is a fine particle having bound to the surface thereof a polyamine having a number average molecular weight of at least 50,000. As now claimed, the fine particle is a porous particle having pores with an average pore diameter of at least 150 Å (the same as at least 0.015 μm), which porous particle has a diameter in the range of 1-100 μm.

In accordance with the present invention, the polyamine is bound to the entire surface of the fine particle. See the specification at page 7, lines 5-11 from the bottom of the page, the

ending of the last full paragraph on that page. The polyamine easily penetrates into the pores of the fine particles, and thus is bound not only to the outer surface of the particles but also to the inner surfaces (of the exposed pores). As a consequence of this topology, a large amount of polyamine can be bound to the fine particle, whereby the anion exchanger will show greatly increased adsorption capacity.

Thus, the term "the surface" in claim 1 should be interpreted in the above manner, i.e., as meaning the total surface including the outer surface of the particle and the inner surface of the pores of the particle.

If the Examiner feels that further claim amendment to reflect this concept would be appropriate, the Examiner is requested to telephone the undersigned at the later given telephone exchange.

Traversal

Applicants' basic position is that there is, contrary to the Examiner's conclusion, as set forth at the top of page 4 of the Action, no motivation for one of ordinary skill in the art to combine Sugaya with Reed. Applicants further respectfully submit that the anion exchanger of the present invention provides unexpected benefits from the hypothetical combination of Sugaya and Reed.

Sugaya

As Applicants have explained in their first response, one major difference between the anion exchanger of the present invention and the anion exchanger disclosed in Sugaya is that the Sugaya anion exchanger is in the form of a membrane, Sugaya containing no disclosure or

suggestion regarding an anion exchanger in fine particle form. Further, and importantly, Sugaya is even completely silent on the use of a polyamine having a number average molecular weight of at 50,000 for membrane treatment, i.e., the polyamines specifically recited in Sugaya have molecular weights far less than the 50,000 claimed in the present application.

Reed

Reed deals with and discloses hybrid ion exchange resins, particularly hybrid ion exchange resins in which a macroporous host polymer is a crosslinked, aromatic polymer functionalized with weak based ion exchange functional groups supplied by high molecular weight polyethyleneimines and in which a gel guest polymer is functionalized with weak acid ion exchange functional groups. Reed, column 1, lines 5-16.

Discussing the prior art at Reed, column 1, lines 17-35, Reed teaches that hybrid ion exchange resins can comprise hybrid copolymers derived from macroreticular polymers with a network of microscopic channels extending through the mask (a net structure) and that the macroreticular polymers have, in bead form, an overall particle size of about 10 to 900 microns and have pores larger than 1.5 to 2 millimicrons (which would equal 0.0015 to 0.002 μm).

In accordance with Reed, the hybrid ion exchange resins are produced in the following manner. Reed, column 1, line 36 to column 2, line 11.

A gel polymer-forming monomer such as an acrylic acid ester is added to an aqueous suspension of the porous macroreticular copolymer, the monomer is adsorbed or imbibed into the pores of the macroreticular copolymer, and the imbibed monomer is polymerized within the macroreticular beads by heating the mixture. In a typical and well-known step in functionalizing

styrene-containing copolymers, they are reacted with chloromethyl methyl ether, and the thus chloromethylated copolymer is aminolyzed with a polyalkylene polyamine such as polyethyleneimine (Reed, column 2, line 46).

It should be specifically noted that a gel of an acrylic acid ester copolymer is formed form the imbibed monomer within the pores of the macroreticular copolymer, and the copolymer gel is not easily chloromethylated during the chloromethylation step. (Reed, column 1, lines 56-59.) Further, during the aminolyzing step, bulky polyethyleneimine (PEI) molecules do not diffuse into the pores of the macroreticular copolymer into which the acrylic copolymer gel is imbibed. Reed, column 3, lines 10-12. As a consequence, aminolysis of the chloromethylated copolymer will occur only on the outer surface of the particles of the chloromethylated copolymer, i.e., aminolysis does not occur on the inner surfaces of the pores thereof. Following aminolysis, the acrylic acid ester copolymer gel imbibed within the pores of the copolymer is hydrolyzed to form acid functional groups. Reed, column 2, lines 8-15.

The thermally regenerable hybrid ion-exchange resin produced in the above manner possesses a significantly greater thermal salt capacity. Reed, column 2, lines 15-18.

Applicants respectfully submit that there is a basic, functional difference between the anion exchanger of the present invention and the hybrid ion exchange resin disclosed in Reed. Specifically, the hybrid ion exchange resin of Reed contains both acidic and basic functionalities, more specifically, basic groups are present on the outer surface of porous particles and acidic groups are present on the inner surfaces of the pores of the porous particles. In contrast, the anion exchange of the present invention is not directed to a hybrid copolymer having both acidic

and basic functionalities, rather, is concerned with a polymer having a single, basic functionality. The anion exchanger of the present invention has basic groups, formed by aminolysis on both the outer surface of the porous polymer particles and on the inner surfaces of the pores of the porous polymer particles.

Combination of Sugaya with Reed

Applicants submit that there is no motivation for one of ordinary skill in the art to combine Sugaya with Reed because of the fundamental differences between Sugaya and Reed.

First, the Reed hybrid resin is in bead form. The Sugaya anion exchanger is in membrane form.

Second, Reed's hybrid resin has both acidic and basic functionalities, and thus exhibits thermally regenerable ion exchange capacity. In distinction, the Sugaya anion exchanger has a single basic functionality.

Thus, the ion exchangers of Sugaya and Reed are fundamentally different from each other in function and shape.

Applicants respectfully submit, contrary to the Examiner's position, that one of ordinary skill in the art would not expect that the use of an anion exchange polymer as taught by Sugaya would be similarly to useful and applicable to the hybrid exchange resins taught in Reed.

Applicants further respectfully submit that the benefits of the anion exchanger of the present invention, i.e., greatly enhanced adsorption capacity, which is obtained by using porous fine particles with basic functional groups on the outer surface thereof and on the inner surface of

pores thereof, would not be expected by one of ordinary skill in the art from the hypothetical combination of Sugaya with Reed.

Accordingly, withdrawal of the rejection is requested.

Respectfully submitted,

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